Adesto

Selection Criteria for IoT Edge Servers for Building Automation and Industrial Controls

A guide to help system integrators and product developers evaluate the pros and cons of new IoT edge server platforms

Building automation and management systems to operate and monitor lighting, HVAC and security systems have been available for a number of years. But with the advent of the Internet of Things (IoT), building and industrial systems managers can gain huge benefits by connecting these legacy infrastructures with newer networks and technologies, and connect them all to emerging cloud services.

This selection criteria guide helps you explore how a new generation of edge server platforms can build a bridge between existing management systems and new IoT and Smart Building technologies.

Echelon by Adesto

Introduction

Though the concepts of Smart Buildings and the Internet of Things (IoT) are relatively recent phenomena, building automation and management systems to operate and monitor lighting, security, heating, ventilation and air conditioning (HVAC), and other building systems have been available for a number of years. However, these traditional systems are usually stand-alone infrastructures, without the ability to easily connect or integrate with other devices and networks to gain operational efficiencies, or extract analytical data to achieve insights for improved utilization, safety, and return on investment.

In today's industrial and building environments, large numbers of central systems remain "a walled garden" operating within a closed control system, unable to expand beyond their initial designs and networks. With the advent of IoT, building and industrial systems managers can gain huge benefits through connecting these legacy infrastructures with newer networks and to emerging cloud services.
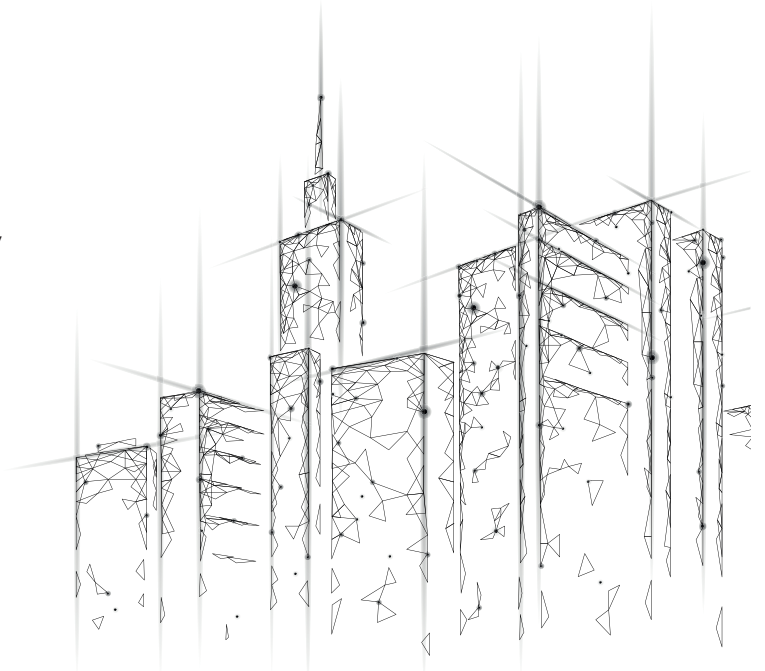
These benefits allow facility and factory managers, building owners and operators, and maintenance staff to extract new value from their existing investments by:

- Connecting existing infrastructure and systems together,
- Adding new types of sensors and devices to the existing system, and
- Providing analysis and insights into higher efficiency, enhanced safety and improved user experiences.

All of these benefits are possible today with modern IoT technologies – but how do you gain these advantages if your existing building or factory management or control systems don't support adding emerging types of devices and sensors, or access to cloud services?

Traditional building and industrial automation devices and systems aren't going away: Rip and replace is not an option for building and factory managers with existing networks, especially since those already installed systems were very costly to put in. What's needed is a way to bridge the gap between older, perfectly functional control and management systems and the latest, highly connected IoT technologies in a way that's cost effective and simple to deploy.

Enter the Edge Server

The edge server provides multi-protocol IoT gateway functionality with programmable interfaces and APIs to link legacy building and industrial systems with emerging IoT technologies and cloud services. In short, edge servers are the crossroads where traditional automation systems meet the IoT. Edge servers are essential in just about every industrial and building environment today.

According to an IHS Markit report, the majority of installed devices (over 75%) in the industrial sector will not be IP connected even by 2020. This will lead to a boom in IoT gateway solutions: Gartner predicts that 90 percent of IoT projects will utilize gateways by 2020; Grand View Research predicts that the edge computing market will expand at an annual compound growth rate of 41 percent between 2018 and 2025.

Billions of Devices

- IP Connected
- Non-IP Connected

0.4

2.1

2017

0.8

3.4
(>75%)

2022

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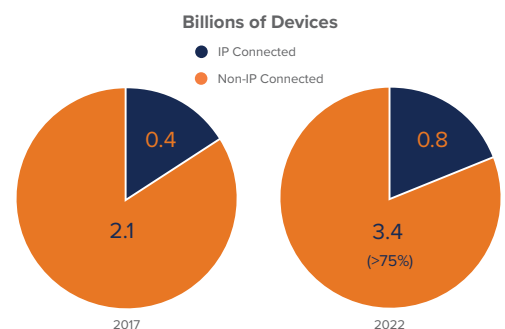
Before beginning your search for an edge server to serve as a platform in your next system integration project or product design, you should know your options. What features and capabilities should be on your edge server checklist?
Top considerations include:

- **Field protocol compatible.** An edge server must be able to communicate with the most common buildings and industrial communications protocols such as Modbus, BACnet, and LON over any desired media such as Ethernet, twisted pair, wireless or RS-485. It should also be able to automatically recognize multiple device types and abstract the data from different protocols securely without losing the contextual information.

- **Open interfaces.** In addition to communicating with commonly deployed protocols, an edge server must have open interfaces to communicate with new types of networks or devices in the south bound side and remote clients or cloud applications on the north bound side. An open southbound interface would allow developers and integrators to create drivers to access any new device types. With an open interface on north bound side, web developers, cloud providers and management systems could securely and easily access data from the edge.

- **Efficient data management.** Even mid-sized building and industrial automation systems produce a lot of data every second, so data flows must be efficient and secure both downstream on the device side, and upstream on the cloud side. Modern publish-subscribe IoT messaging mechanisms like message queuing telemetry transport (MQTT) provides an efficient architecture for brokering and distributing data to minimize traffic flows and ensure reliable communications.

- **End-to-end.** An edge server should provide ability to provision large numbers of devices and coexist with existing networks. It should feature built-in services for monitoring and controls such as scheduling, alarming and logging of data, and offer network management capabilities to route messages to correct places. An effective edge server should also make connecting to cloud services simple and secure. All of this functionality should be available out of the box, through an easy to access and navigate user interface, and without complex programming and software integration procedures.

- **Extensible services.** IoT edge servers should have open, freely available software interfaces and APIs for creating applications and accessing them from the cloud; otherwise, you may be at the mercy of the provider who can continue to increase costs — and charge you for an ongoing series of incremental fees for these services. An open system ensures that your customers can use the services or vendor products of their choice at a predictable, market-rate price, as well as ensure the ability to add new capabilities well into the future.
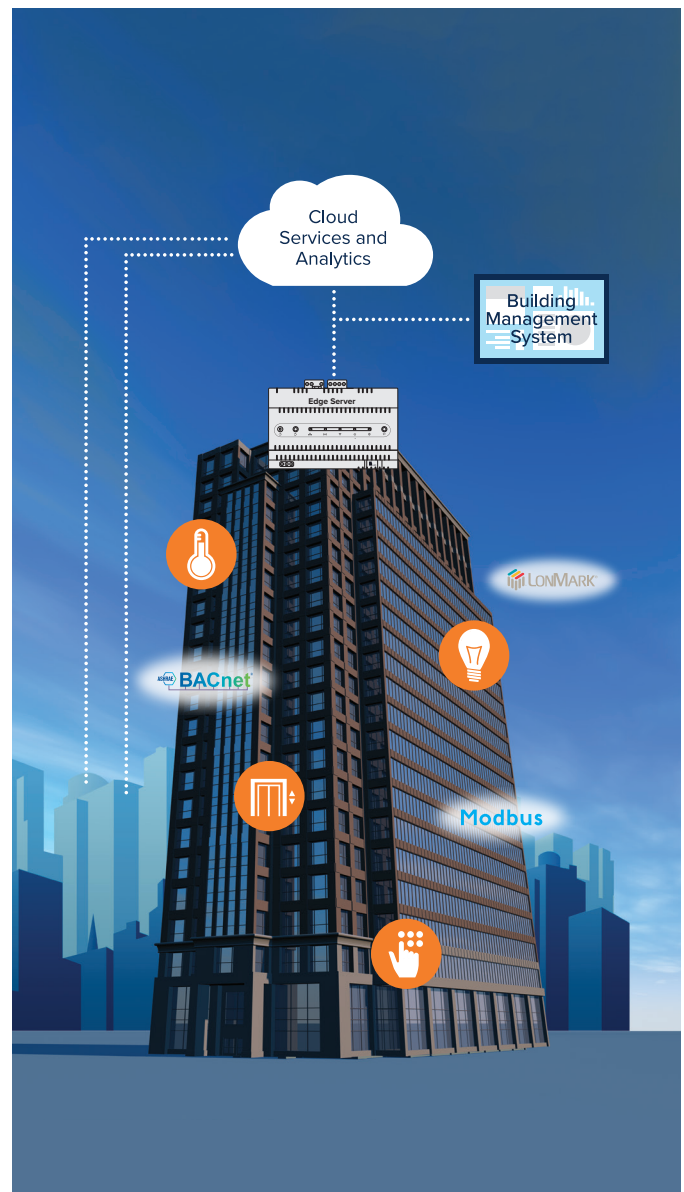
What's Available Today?

In today's market, there are two main types of edge server solutions: Closed field servers from building and industrial automation vendors, and open industrial gateways from IT vendors.

Major building automation vendors offer edge server-like solutions with built-in support for protocols and devices only compatible within their offerings. These solutions are valuable if your entire automation infrastructure is standardized on compatible protocols and supported devices. However, these proprietary systems can lead to single-vendor lock-in that limits openness and extensibility to products outside of their offerings. For instance, proprietary edge servers may not link with out-of-network cloud services without purchase of costly software bundles, or not provide drivers to communicate with third-party devices, undercutting the adaptability of the platform. Closed-box edge servers may also disallow inter-operability with innovative IoT sensors and devices and – more importantly – with cloud services offering workflow and utilization optimization, or predictive maintenance.

Open-box industrial gateways don't restrict users to a limited ecosystem of functionalities and deliver much greater open-ness and configurability. This offers developers the potential of creating customized solutions for each individual infra-structure install base. However, these platforms are essentially blank Linux or Windows machines, and to develop a fully functioning edge server with the necessary protocols and interfaces for building and industrial automation applications will take extensive software development and testing before you can deploy an IoT project of any scale. You will need to build everything from the ground up, which can take months or years of engineering work.

For most people in the market for an edge server, a key consideration is selecting a product that works simply and intuitively right out of the box. With a system that already has the features and functionality you require built in, you won't need to spend a lot of time building or integrating this functionality. But you also don't want to invest in a system with off the shelf functionalities that ultimately restrict its adaptability and extensibility.

At Adesto, we believe you can have the best of both worlds: an edge server that comes with pre-integrated protocols and functionality so the system offers immediate value, with the flexibility to extend functionality into the future as needs and technologies evolve.

Introducing SmartServer IoT

SmartServer IoT is a multi-protocol industrial edge server with an open and extensible interface that utilizes a novel messaging and data management architecture to simplify connections to both new and legacy industrial devices – and to the cloud. It provides a rich layer of APIs for controls and web services, dramatically reducing time to deployment for IoT applications from months to hours.
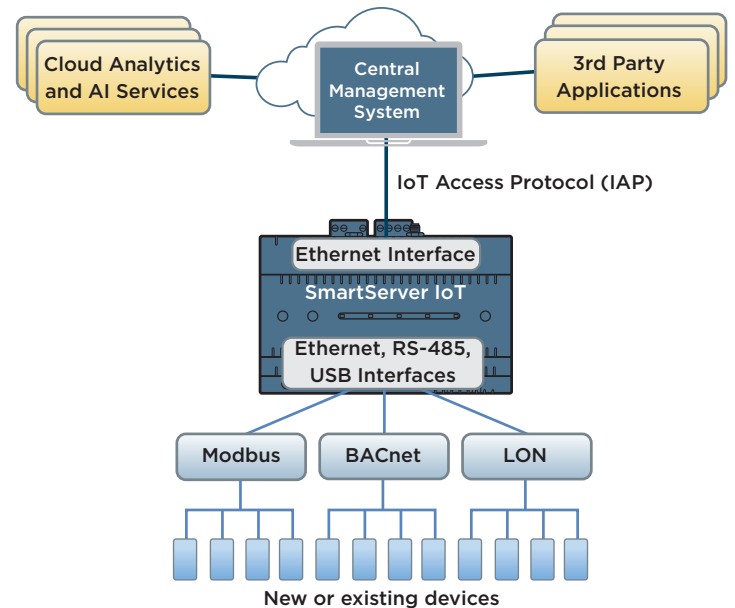

SmartServer IoT offers:

- **An end-to-end IoT solution**, with modular interfaces for the most popular industrial communications protocols including LON, BACnet, and Modbus, among others. This eliminates the requirement to integrate protocol stacks and abstract the data from a variety of device types for interoperability.

- **Local services for controls and automation**, so you don't need to develop them on your own. Pre-integrated device and data management apps — such as connecting, routing, scheduling, data logging, and alarming — operate at the network edge for faster, more responsive systems.

- **A user-friendly, web-based management system**, for simplifying the integrator workflow of creating, provisioning and managing devices with configurable dashboards, alarms and reports.

- **An extensible open integration platform**, with freely available modern APIs based on REST, for accelerating web apps and HTML development, and MQTT, for custom controls applications. This rich layer of APIs ensures integration with any IoT device and application without restrictions.

- **Secure IoT messaging to remote clients and cloud services**. Using MQTT protocols, SmartServer IoT can gather data from devices and send it efficiently to any public or private cloud without opening ports or punching holes through firewalls.

- **Compatibility with open installation tools**, to make it easy for integrators to deploy solutions with devices from any vendor by using a single tool to reduce training needs for provisioning and troubleshooting.

SmartServer IoT speeds and enhances industrial IoT solution design and deployment for both product development by OEMs and for custom solution development by system integrators.

OEM Benefits:

- **Faster time to market**, with out-of-the-box support for field protocols and management services.

- **Differentiated, competitive offerings**, offering choice in cloud hosting, choice in network types, and choice in supported devices.

- **Manufacturers can focus on their core competency, not on networking:** Easy-to-use APIs eliminate the need for extensive networking and cloud experience.

Integrator Benefits:

- **Improved project ROI**, with reduced development time and faster project deployment.

- **Flexibility in implementation**, with a choice of multiple interfaces and protocols and an ecosystem of interoperable devices.

- **Improved customer satisfaction and business outcomes**, with access through cloud analytics and custom web services.

Use Case: AI & Real-time Street Light Decisions at the Edge

A recent proof of concept (PoC) between Adesto and the City of Spokane, Washington, explores new and exciting ways of integrating smart street lighting and traffic management systems with a SmartServer.

Adesto is testing the capabilities of new cognitive camera technology with self-learning AI at a busy Spokane intersection. This intersection experiences a higher level of traffic during the commute hours and a lower level of traffic during the evening and night. The traditional traffic signal and streetlight systems at this intersection lacked the ability to adjust to traffic volume or lighting conditions, wasting energy when the systems' operations were underutilized.

In the PoC, smart video cameras capture street-level traffic data and ambient light readings, and an embedded AI engine in the camera system converts the traffic video to data, which is sent to a SmartServer edge server kiosk located at the intersection. Here, the data is analyzed in real time, and the SmartServer signals the adaptive lighting systems in adjacent streetlights to adjust luminance levels according to the flow of traffic and the time of day. The SmartServer also sends data and alerts to the cloud-based central management system (CMS), which is in charge of monitoring and alarms, reporting, and remote device provisioning and management.

The SmartServer integrates raw data from multiple edge networks and provides it to the cognitive lighting system, which uses AI to intelligently adjust street lighting based on the conditions on the road, maximizing energy performance without sacrificing safety. Based on preliminary data, Spokane is projecting a 30-35 percent energy savings from the adaptive lighting.

Intelligent cameras at the intersection provide dynamic responsiveness.

Controls increase light levels to full output during peak traffic and reduce light levels during low traffic periods.

Summary

If you're in the market for an edge server for your next project, take time to consider the pros and cons of the new generation of IoT edge server platforms now available. With the new edge server solutions now on the market, you'll be able to address the needs of your customers much more quickly and reliably than in the past, with a solution that can easily adapt to new protocols and systems, extending its value into the future.

Don't just go on autopilot and select your previous solution. With a system from a building automation system (BAS) vendor or a networking/IT vendor, you may find drawbacks in terms of flexibility for the first option, and complexity for the second. Both options can produce unintended time and cost impacts. A typical integration project in these scenarios can take months – but with SmartServer IoT you can get going in an afternoon.

> " *A typical integration project in these scenarios can take months – but with SmartServer IoT you can get going in an afternoon.* "

If you're an integrator installing/deploying systems in the field, SmartServer IoT makes it quick and easy for you to get the system up and running. Our CMS allows you to create users, alarms, schedules, data logging – everything you need to get fast, accurate results.

If you're a developer designing an IoT gateway for an OEM, SmartServer IoT provides the open APIs that enable you to quickly and simply create dashboards, visualization, and other management interfaces using familiar tools such as HTML, JavaScript and Node.js.

With SmartServer IoT, you're not locked into a closed ecosystem of proprietary technologies, and you're not stuck developing protocols and interfaces from scratch for a wide-open system. SmartServer IoT provides a bridge that combines the pre-integrated, out-of-the-box functionality of building and industrial systems with the flexibility and adaptability of connecting to emerging IoT networks and cloud services, extending value into the future. You get the best of both worlds.
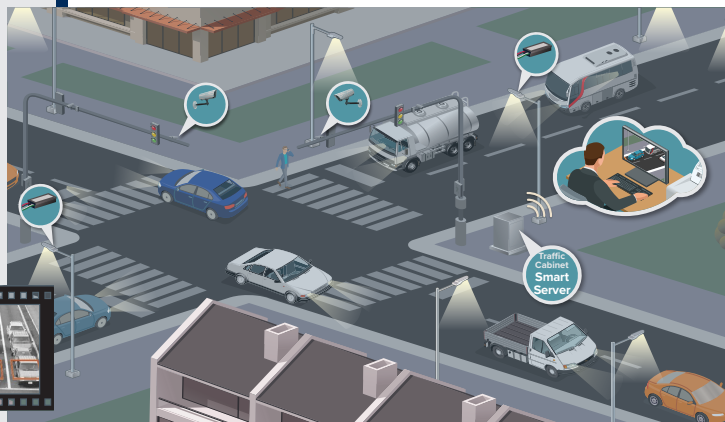
About Adesto

Adesto is a leading provider of innovative, application-specific semiconductors and embedded systems that comprise the essential building blocks of Internet of Things (IoT) edge devices operating on networks worldwide. The company's broad portfolio of semiconductor and embedded technologies are optimized for connected IoT devices used in industrial, consumer, communications and medical applications. Its Embedded Systems Division, formed around the September 2018 acquisition of Echelon Corporation, develops open-standard networking platforms and tools for connecting, monitoring and controlling devices in commercial and industrial IoT deployments. Today there are more than 140 million Echelon-powered connected devices worldwide. The new Echelon SmartServer IoT platform enables companies to drive intelligent and automated decisions in the IIoT through its revolutionary open, extensible architecture.

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